

Claims:

What is claimed is

1 1. A method of testing an optoelectronic device including a VCSEL, said VCSEL
2 having a cavity resonator formed by a relatively low reflectivity frontside reflector and a
3 relatively higher reflectivity backside reflector, comprising the steps of:
4 at an intermediate stage of its assembly, measuring an optical signal leaking through
5 said backside reflector of said VCSEL,
6 determining from the measured signal whether a selected quality of said VCSEL
7 meets a predetermined specification, and then
8 finishing said device in a configuration designed to use radiation emitted from
9 said frontside reflector of said VCSEL.

1 2. The invention of claim 1 wherein said measuring step includes aligning a probe with
2 said device and then measuring radiation leaking from backside reflectors of a multiplicity of
3 VCSELs without performing another act of aligning said probe.

1 3. A method of testing a bottom-emitting VCSEL array at an intermediate stage of its
2 manufacture, the VCSEL array including VCSELs each having a cavity resonator formed by a
3 relatively low reflectivity frontside reflector and a relatively higher reflectivity backside
4 reflector, comprising the steps of:
5 aligning a probe with one side of said VCSEL array, said probe including electronic
6 circuits coupled to each of said VCSELs for causing said VCSELs to emit radiation and
7 including photodetection circuits coupled to each of said VCSELs for detecting radiation leaking
8 through each of said backside reflectors,
9 without performing another act of aligning said probe, determining from said detected
10 backside radiation whether a selected quality of each VCSEL meets a predetermined
11 specification, and then
12 for those VCSEL arrays that meet specification, finishing their manufacture in a
13 configuration designed to use radiation emitted from said frontside reflectors.

1 4. The invention of claim 3 wherein said intermediate stage includes fabricating said
2 VCSEL array on a substrate and said aligning and determining steps are performed without
3 removing said substrate.

1 5. The invention of claim 4 wherein said finishing step includes removing said substrate
2 before final assembly.

1 6. A method of testing a bottom-emitting VCSEL array at an intermediate stage of its
2 manufacture, the VCSEL array including VCSELs each having a cavity resonator formed by a
3 relatively low reflectivity frontside reflector and a relatively higher reflectivity backside
4 reflector, comprising the steps of:

5 aligning a probe with said VCSEL array, said probe including a first array of electronic
6 circuits coupled to one side of said VCSEL array and to each of said VCSELs for causing said
7 VCSELs to emit radiation and including a second array of photodetection circuits, including
8 photodetectors coupled to an opposite side of said VCSEL array and to each of said VCSELs for
9 detecting radiation leaking through each of said backside reflectors,

10 without performing another act of aligning said probe, determining from said detected
11 backside radiation whether a selected quality of each VCSEL meets a predetermined
12 specification, said determining step including energizing said electronic and photodetection
13 circuits in a fashion to reduce cross-talk between VCSELs and each photodetector, and then

14 for those VCSEL arrays that meet specification, finishing their manufacture in a
15 configuration designed to use radiation emitted from said frontside reflectors.

1 7. The invention of claim 6 wherein said VCSELs are energized in a first predetermined
2 sequence and said photodetection circuitry is energized in a second predetermined sequence so
3 as to reduce cross-talk.

1 8. The invention of claim 7 wherein all of said VCSELs are energized concurrently, but
2 said photodetection circuits are energized in a sequence that reduces said cross-talk.

1 9. The invention of claim 8 wherein said photodetection circuits are energized in a
2 sequence that turns on a particular one of said circuits while concurrently turning off circuits
3 adjacent thereto.

1 10. The invention of claim 7 wherein all of said photodetection circuits are energized
2 concurrently, but said VCSELs are energized in a sequence that reduces said cross-talk.

1 11. The invention of claim 10 wherein said VCSELs are energized in a sequence that
2 turns on a particular one of said VCSELs while concurrently turning off VCSELs adjacent
3 thereto.

1 12. The invention of claim 7 wherein first groups of said VCSELs are energized in said
2 first sequence and second groups of said circuitry are energized in said second sequence, with
3 VCSELs in each of said first groups being energized concurrently with one another and circuits
4 in each of said second groups being energized concurrently with one another.

1 13. The invention of claim 6 wherein said intermediate stage includes fabricating said
2 VCSEL array on a substrate and said aligning and determining steps are performed without
3 removing said substrate.

1 14. The invention of claim 13 wherein said finishing step includes removing said
2 substrate before final assembly.

1 15. Apparatus for testing an optoelectronic device at an intermediate stage of its
2 manufacture, said device including a VCSEL having a cavity resonator formed by a relatively
3 low reflectivity frontside reflector and a relatively higher reflectivity backside reflector, said
4 apparatus comprising:

5 a probe including a photodetection circuitry for measuring an optical signal leaking
6 through said backside reflector of said VCSEL, and
7 means for determining from the measured signal whether a selected quality of said
8 VCSEL meets a predetermined specification.

1 16. The invention of claim 15 further including means for aligning said probe with said
2 device just once and wherein said photodetection circuitry measures radiation leaking from
3 backside reflectors of a multiplicity of said VCSELs.

1 17. Apparatus for testing a bottom-emitting VCSEL array at an intermediate stage of its
2 manufacture, the VCSEL array including VCSELs formed on a substrate, each VCSEL having a
3 cavity resonator formed by a relatively low reflectivity frontside reflector and a relatively higher
4 reflectivity backside reflector, said apparatus comprising:

5 a probe including electronic circuits coupled to each of said VCSELs for causing said
6 VCSELs to emit radiation and including photodetection circuits coupled to each of said VCSELs
7 for detecting radiation leaking through each of said backside reflectors,

8 means for aligning said probe just once with one side of said VCSEL array, and

9 means for determining from said detected backside radiation whether a selected quality of
10 each VCSEL meets a predetermined specification.

11 18. The invention of claim 17 wherein said aligning means and determining means
12 function without removing said substrate.

1 19. Apparatus for testing a bottom-emitting VCSEL array at an intermediate stage of its
2 manufacture when its substrate is intact, the VCSEL array including VCSELs each having a
3 cavity resonator formed by a relatively low reflectivity frontside reflector and a relatively higher
4 reflectivity backside reflector, said apparatus comprising:

5 a probe including a first array of electronic circuits coupled to one side of said VCSEL
6 array and to each of said VCSELs for causing selected ones of said VCSELs to emit radiation
7 and including a second array of photodetection circuits, including photodetectors coupled to an
8 opposite side of said VCSEL array and to each of said VCSELs for detecting radiation leaking
9 through each of said backside reflectors,

10 means for aligning said probe just once with said VCSEL array, and

11 means for determining from said detected backside radiation whether a selected quality of
12 each VCSEL meets a predetermined specification, said determining means including means for

13 energizing said electronic and photodetection circuits in a fashion to reduce cross-talk between
14 VCSELs and each photodetector.

1 20. The invention of claim 19 wherein said probe energizes said VCSELs in a first
2 predetermined sequence and said photodetection circuitry in a second predetermined sequence so
3 as to reduce cross-talk.

1 21. The invention of claim 20 wherein said probe energizes all of said VCSELs
2 concurrently, but energizes said photodetection circuits in a sequence that reduces said cross-
3 talk.

1 22. The invention of claim 21 wherein said probe energizes said photodetection circuits
2 in a sequence that turns on a particular one of said circuits while essentially simultaneously
3 turning off circuits adjacent thereto.

1 23. The invention of claim 20 wherein said probe energizes all of said photodetection
2 circuits concurrently but energizes said VCSELs in a sequence that reduces said cross-talk.

1 24. The invention of claim 23 wherein said probe energizes said VCSELs in a sequence
2 that turns on a particular one of said VCSELs while concurrently turning off VCSELs adjacent
3 thereto.

1 25. The invention of claim 20 wherein said probe energizes first groups of said VCSELs
2 in said first sequence and second groups of said circuitry in said second sequence, with VCSELs
3 in each of said first groups being energized concurrently with one another and circuits in each of
4 said second groups being energized concurrently with one another.